time lecture xiii. is reached, the evidence is overwhelming as to the extent of hysterical symptoms and the ground of their relationship to one another. "Dissociation" and "suggestibility" are the words employed to describe the underlying mental state, and their exact meanings are very carefully and thoroughly worked out. The final outcome is a definition of hysteria, an enumeration of its direct and indirect stigmata, and incidentally a theory as to the nature of personal synthesis, with which this disease is so closely connected.

To medical practitioners and psychologists alike the work should be of supreme value. W. B.

THEORY AND PRACTICE OF LUBRICATION.

Lubrication and Lubricants. A Treatise on the Theory and Practice of Lubrication, and on the Nature, Properties, and Testing of Lubricants. By Leonard Archbutt and R. Mountford Deeley. Second edition, thoroughly revised and enlarged. Pp. xxxii+528. (London: C. Griffin and Co., Ltd., 1907.) Price 21s. net.

THIS work may be divided into two parts, which, in fact, have little connection with one another. The first is that which deals with the chemical and physical properties of lubricants generally, and will appeal more particularly to analytical chemists, to whom samples of lubricants are submitted for the purpose of estimating their commercial value. So far as one can judge, this part of the work is particularly clear; full directions are given for carrying out any of the tests, in order to obtain such things as the free acids. This will, however, hardly appeal to the average user of lubricants, as what he requires is some simple mechanical test which will, more or less, indicate the value of the oil. The second portion of the work deals with the mechanical testing of oil, and also the design and construction of bearings generally, together with the general theory of friction, as given in chapter iv. This is particularly well written, and gives the full theory of lubrication as developed by Osborne Reynolds, Goodman, and Towers, and will repay a careful study. An account is given of the various oil-testing machines as designed by Thurstan, Smith, and Goodman. Judging from our own experience, while these machines when extremely carefully handled give trustworthy results, one is never quite certain as to what is really being obtained; whether it is a test of the lubrication itself, of the materials forming the bearing, or of the condition of the bearing. We should be inclined to say that it would probably be a small part of each, and, moreover, it does not give much idea as to the value of the lubricant for continuous use, which is now the rule for engine work generally. Doubtless, owing to the great length of the book, some 500 pages, the authors have been unable to devote a large space to the design and lubrication of bearings, although they give much useful information as to the composition of bearing metals generally, and also the admissible loads. They do not, however, give the attention to forced lubrication which we consider it deserves. The whole tendency of modern engine practice, either with enclosed or open engines, is to substitute pressure lubrication for gravity, and this has entailed wholly different construction of bearings from those with the ordinary drip lubrication.

The large subject of ball and roller bearings is dismissed in some three pages, and, considering the importance and growing use of the ball bearing in large sizes, we think this type of bearing deserved fuller attention. The mechanical lubrication by means of sight-feed lubricators, which allows the attendant to regulate exactly the quantity of his oil, is well illustrated, and rightly so, because this method is found in practice very considerably to economise the oil supply. Splash lubrication, as used by Willans and by many motor-car engineers, is alluded to, but its defects as regards the oil working up into the motor cylinders are not pointed out, nor is it shown that this method of lubrication is fast being driven out in favour of a pressure system. The authors, in the chapter on gas-engine cylinder lubrication, give some interesting analyses of the deposit found in the cylinders, and point out that the deposit is not wholly of a carbonaceous nature, but contains quite a considerable portion of sulphur obtained from the gas. They also recommend the use of pure mineral oils, as against the mixture of a small quantity of a neutral fixed oil. This wholly agrees with our own experience, namely, that a pure mineral oil is the only one possible to use when the compression of the engine is in the neighbourhood of 200 lb. per square inch. It would almost appear as if the whole difficulty of running at very high compressions is to prevent deposits of carbon. The only way to overcome this is to use an oil which will entirely burn, and in very small quantities. All those who are interested in lubrication generally will welcome Messrs. Archbutt and Deeley's work, more especially those in a consultative position, but we fear that, owing to its length and the predominance of the chemical and physical side, it will not be of the service to engineers generally that a smaller and less scientific work would be, as it must be borne in mind that the great majority of those who have to use lubricants have neither the time nor inclination to make accurate chemical tests.

F. W. BURSTALL.

OUR BOOK SHELF.

The Savage South Seas. Painted by Norman H. Hardy. Described by E. Way Elkington. Pp. xii+211. (London: A. and C. Black, 1907.) Price 20s. net.

To those who know the parts of Melanesia which Mr. Norman Hardy portrays, or who, like the writer, have been much of his work, this book will come as something of a disappointment; and this from no fault of the artist, who is generally successful in reproducing, not only the physiognomy, but the musculature and the tricks of movement of the folk whom he portrays. The truth is that the tone of the reproductions (apparently made by the three-colour process or one of its modifications) of Mr. Hardy's water-colour sketches leaves much to be desired; in many of the reproductions there is a darkening of

the colour scheme, giving crepuscular and storm effects—where none are intended—to many of the landscapes, as plates 2 and 4. In the case of illustrations showing figures, the tone of the whole group may be so lowered that people, houses and utensils show up in scarcely differentiated tints of brown against a sky for the colour of which the writer knows no warrant (illustration 19).

But there are also many charming and realistic pictures, such as plates 3 and 33, though in the last the excellence of the drawing and colouring of the canoe and the figures seated therein is perhaps somewhat discounted by the excess of grey and brown in the landscape.

Plate 16 may be picked out for special praise. It gives a very real impression of the Rigo dubu, seen at midday, when the glare of the sun lightens the grey of its weather-beaten posts and renders the yellowish soil on which it stands almost white.

In spite, then, of defects of the kind mentioned, the illustrations of this book give a better idea of Melanesia than can be obtained by photographs or black and white drawings, and so the work must be pronounced a success. Mr. Hardy is also to be congratulated on the accuracy of his observation, for in so few instances are there ethnographical inaccuracies in the plates or their accompanying short descriptions that it may be useful to point out the chief of these in as far as they affect New Guinea. Probably no girl ever danced her way to "the dubu dance" flirting her petticoats the while, as is shown in the frontispiece. Kaivakuku masks do not exist among the Roro tribe, though they occur among the Waima and Kevori, both Roro-speaking tribes. The feather head-dresses of the girls (illustrations 14 and 15) are distinctly yellowish, not red as shown in the plates; indeed, red feathers are carefully excluded from this dancing head-dress, the parrots providing the feathers being subjected to special treatment in order that their feathers may be of the desired colour.

In this book the illustrations so far exceed the text in importance and quality that little need be said concerning the latter, which contains many inaccuracies and misprints, is written in poor English, and generally falls far below the level of other volumes contained in this series. C. G. S.

A Text-book on Hydraulics, including an Outline of the Theory of Turbines. By Prof. L. M. Hoskins. Pp. v+271. (London: Archibald Constable and Co., Ltd., 1907.) Price 10*s.* 6*d.* net.

THIS book is intended for the instruction of engineering students during their university or college course, who have already acquired a good practical knowledge of pure mathematics, and possess a fair elementary acquaintance with the principles of mechanics. After a short introductory chapter dealing with definitions and principles, followed by a chapter on hydrostatics, the flow of water through orifices under different conditions is considered, and Torricelli's theorem is stated, and instances of its application explained. Bernoulli's theorem, which the author calls the general equation of energy, and upon which he bases his explanations of the problems of the steady flow of liquids, and its applications, form the subject of the next four chapters. Various formulas for the flow of water in pipes under definite conditions are then deduced from the general equation of energy; whilst a separate chapter is devoted to a discussion of the methods of estimating the frictional loss of head in pipes.

In treating of uniform flow in open channels, the author, after referring to Chézy's formula, $v=c\sqrt{rs}$, as the basis for calculating the mean velocity, and alluding to Bazin's experiments for determining the influence of the nature of the surface and the shape of the channel in modifying c, deals fully with the well-known, general, empirical formula for c deduced by Ganguillet and Kutter from the measurements of flow in a wide range of channels, which is a function of the slope, the hydraulic radius, and a coefficient of roughness depending on the nature of the surface of the channel. To facilitate the adoption of this complex formula, a table is given of the values of c computed for a certain range of conditions, and also a graphic diagram from which they can be obtained by measurement. The more complicated question of non-uniform flow in open channels is next discussed, deduced in the first instance from the general equation of energy for streams of variable cross-section; and the portion relating to hydraulics is concluded by a consideration of the different methods, direct and indirect, by which the discharge of streams differing greatly in volume can be measured.

The theory of turbines forms the subject of the last seven chapters of the book, under the respective headings dynamic action of streams, theory of steady flow through rotating wheel, types of turbines and water wheels, theory of the impulse turbine, and of the reaction turbine the tangential water wheel, and turbine pumps. The book terminates with three appendices, in which the general equation of energy is applied to the steady flow of gases, relative motion is explained, and tables of conversion factors are given. The subjects dealt with are elucidated by one hundred and thirty-seven simple diagrams in the text, and examples are added in almost every chapter relating to its contents, for the student to work out, to which the answers are appended. This book will be valuable in training engineering students possessing a fair knowledge of mathematics to solve any problems in hydraulics they are likely to meet with in practice, and it will also furnish them with an insight into the principles on which the working and efficiency of turbines are based.

Flora of Sussex, or a List of Flowering Plants and Ferns found in the County of Sussex. By Rev. F. H. Arnold. Pp. xxii+154. (London: Simpkin, Marshall and Co., Ltd.; Arundel and Horsham: Mitchell and Co, 1907.) Price 5*s.* net.

THIS is a new and revised edition of the flora, including phanerogams, pteridophytes, and Characeæ, brought out by the author in 1887. The principal changes will be found in the additions to the species and many new localities. The introduction is not altered except for the increase in the list of contributors, to which are added the names of Mr. C. E. Salmon, Mr. W. Whitwell, Rev. E. Ellman, and Rev. E. S. Marshall. The last-named has been a most energetic worker, especially in West Sussex, and several of the new species were first discovered by him. A complete revision will be noted for the species of Rubus, for which the localities are provided chiefly on the authority of Messrs. Salmon, Marshall, and Rogers, and also a revision of the genus Salicornia. Among the species added to the county list are *Epilobium Lamyi, Wolffia arrhiza, Utricularia neglecta, Chenopodium botryoides, Spartina Townsendi,* and *Spartina alterniflora,* first found by the author. Most of these species were previously known from adjacent counties, as noted in the appendix, where the list has escaped revision. The author was not fated to see the publication of this book, which will be welcomed by all systematic botanists sojourning in Sussex; a note saying that he dictated the preface on the very day that he was taken ill is added by his daughter, who has also prepared the three illustrations which are included.